Pekka Nikrus | Extended Abstract

LIGHT AS AN ENVIRONMENTAL PHENOMENON IN THE CONTEXT OF ACHIEVING A PHOTOGRAPH

In my doctoral thesis, *The Technology of Achieving a Photograph: A Systemic Perspective*, I observe and abstract the technological functions of a diverse but distinct array of equifinal devices used for creating photographs. Through these abstractions, within the framework of systemic thinking, I construct a universal system of achieving a photograph, which constitutes a description of the functional essence of the technology. The universal system as a model integrates a complementary theoretical perspective to a more everyday approach to technology (cf. Meadows 2008, 6; Skyttner 2005, 497).

The system I study is simple. It consists of a small number of parts and performs its function in a linear and predictable way (Skyttner 2005, 105; Williams & Hummelbrunner 2010, 24). It is also an open system which depends on the environment for its input (cf. Skyttner 2005, 62). As the relationship between the system and its environment is the key to understanding the system's purpose, examining the environment is not optional (cf. Hammond 2017, 5). And herein lies the objective of my paper: To create an understanding of the system's input as a phenomenon of the environment. In addition, I also feel that light is often taken far too much for granted, even by myself.

Setting the scene

I begin my paper by defining the environment in systemic terms. I then continue by taking a brief look at the origin of light by leaping back in time to the Big Bang: How, in the beginning there was no light (Smolin 2013, 206), but after 150 million years, stars started to form (Clery 2016, 211). From there, I move on to the scientific understanding of light from Alhazen to the naming of the photon: How radio waves, when discovered, were seen as “rays of light of very great wavelength” (Twersky 1965, 1213) and how the contemporary understanding of light postdates photography as an invention.

I also define light within the context of my thesis: As my focus lies in the functions of technology, I see no reason to limit my thinking to visible light. Hence, the word light refers to electromagnetic waves that interacts with matter, in the same vein as in the context of modern spectroscopy (cf. Ball 2001, 22; 15). Here, I also note, in passing, that there is quite a lot more to light, such as it can stop (Zyga 2018), but while this is very interesting and worth mentioning, it is also beyond the scope of my thesis and my understanding.

The content in light

Next, I aim to understand where the content in light resides. My starting point is the interaction between light and matter: transmission, reflection and absorption—three processes which generally, to some degree, take place simultaneously (Ball 2001, 23). The interaction changes various wave properties of light, like amplitude and frequency (Ball 2001, 13; 22), effectively reproducing matter in the properties of light. I use the idea of *the illuminated space* (see fig. 1) to describe how light interacts with matter in the ceiling, the walls, on the floor, under the chairs and the sofa… everywhere. The reproduction of matter in the properties of light is fundamental for achieving a photograph and, of course, for seeing too.

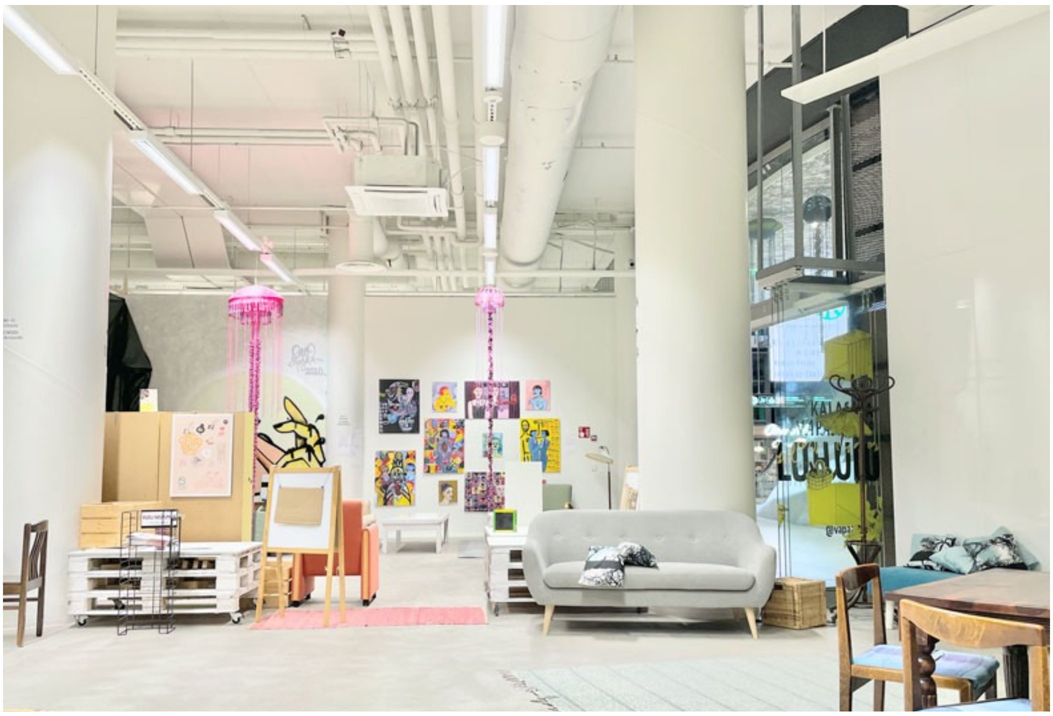

Fig. 1: *The illuminated space.*

In the illuminated space, the interaction of light and matter is an abundant atomic-level process. Every square metre of every surface encompasses a million square millimetres, and one square millimetre of any surface consists of trillions of atoms, all of which interact with continuous streams of light. All these millions of trillions of atoms receive waves of light from all over the environment and reemit changed waves back to it. Every photon-sized[1] spot in the air and on every surface of the illuminated space sees photons coming from and going to every conceivable photon-sized spot positioned in a straight, unobstructed line.

I conclude that light within the system of the environment is dense in the illuminated space. It is a "sea of energy" (Gibson 1986, 63). But to fulfil its role as a part of human activities, the technology of achieving a photograph cannot produce results on an atomic scale—it has to function on a human scale[2], and on this scale, light needs to be dense (cf. Land & Nilsson 2012, 65). As every wave of light carries only a minuscule amount of content, lightwaves must come in vast amounts to work as input for a system. Therefore content in light can be said to consist of an enormous amount of particles with scarce substance.

Because our environment, a systemic whole in its own right, did not evolve for us, but we into it, it cannot be said that the environment communicates with us, but that it is up to us to perceive the environment and interpret it (cf. Gibson 1986, 63). I see this as a constructivist perspective, which also guides my understanding of technology's relation to the environment: Light as a phenomenon is organised according to the system it belongs to, and as such, the content in light is not suitable for processing by another system without at least some reordering or conversion. Also, I have chosen to use the word *content* rather than *data* or *information*: content is better suited to systems that produce and process light without taking a conscious stance on it.

Keywords: systemic thinking, environment, light, content, technology

1 If the red dot of a laser pointer was enlarged to the same size as the Earth's orbit around the Sun, i.e. 300 million kilometres in diameter, the size of a single photon could be estimated to be about a millimetre (Beech 2012, 200).

2 We cannot see objects below the wavelength of visible light (Richards 2011, xix): an atom is less than a thousandth part of the wavelength of the lower limit of human vision.

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